REMARKS

Claims 1-17 and 19-74 are currently pending in the subject application and are presently under consideration. Claims 19, 37, 40, 41, 44, 47, and 74 have been amended. A listing of all claims can be found at pages 2-14. Applicants' representative notes with appreciation the indication that claims 2, 5 and 15 would be allowable if rewritten in independent form to recite limitations of respective base claims and any intervening claims. It is believed such amendments are not necessary in view of the comments herein. However, applicants' representative reserves the option to recast such claims at a later date if necessary.

Favorable reconsideration of the subject patent application is respectfully requested in view of the comments and amendments herein.

I. Claim Objections

Claims 19-24 are objected to because claim 18 has been cancelled and claim 19 lacks of antecedent dependent claim. Claim 19 has been amended herein to depend from claim 15. Accordingly, it is believed that this objection is moot.

II. Claim Rejections

Claims 37, 47 and 74 stand rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement and contain "smoothing the estimated channel." Claims 37, 47 and 74 have been amended herein to recite "truncating the estimated channel." Accordingly, it is believed that the rejection of these claims is moot; and withdrawal thereof is requested.

III. Rejection of Claims 1, 13, and 14 under 35 U.S.C. 102(e)

Claims 1, 13, and14 stand rejected under 35 U.S.C. §102(e) as being anticipated by Klimovitch (U.S. Application 2002/0111142). This rejection should be withdrawn for at least the following reasons. Klimovitch does not anticipate each and every element of the subject claims.

> For a prior art reference to anticipate, 35 U.S.C. §102 requires that "each and every element as set forth in the claim is found, either

> expressly or inherently described, in a single prior art reference." *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950 (Fed. Cir. 1999) (*quoting Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)).
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> "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.'" Id. (*quoting Continental Can co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991)). "Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *Mehl/Biophile Int'l Corp. v. Milgraum*, 192 F.3d 1362, 1365, 52 USPQ2d 1303, 1305 (Fed. Cir. 1999), reh'g denied, 1999 U.S. App. LEXIS 31386 (Fed. Cir. Oct. 27, 1999) (*quoting In re Oelrich*, 666 F.2d 578, 581, 212 USPQ 323, 326 (CCPA 1981)).

The subject application relates to channel estimation techniques for wireless communication systems utilizing multiple subcarriers. Independent claim 1 (from which claim 13 depends, recites *a method for determining channel estimates at a receiver for a wireless communication system using orthogonal frequency division multiplexing (OFDM) over a plurality of OFDM subcarriers, the method comprising: receiving training signals ... computing an estimated channel impulse response from ... and* ***adaptively truncating the estimated channel impulse response in the time domain to improve a signal-to-noise ratio of the channel estimates***. Thus, to increase the signal-to-noise ratio of the channel estimates, the impulse response is advantageously cut off (truncated) in time at a point that optimizes a tradeoff between channel power and noise. (*See e.g.,* pg. 14, ¶[0061] and pg. 20, ¶[0084].) Independent claim 14 recites similar limitations relating to *a method of channel estimation for a receiver of a multiple input, multiple output (MIMO) communication system wherein signals are transmitted using orthogonal frequency division multiplexing (OFDM) over a plurality of OFDM subcarriers, the method comprising ...* ***adaptively truncating the time domain channel impulse response estimate to improve the signal-to-noise ratio of the channel estimates***. Klimovitch does not anticipate such novel features.

Klimovitch relates to estimating multiple-input multiple-output wireless channels. Klimovitch discusses "truncating [a] nontruncated time-domain channel response by selecting certain of [a] first set of coefficients to generate a second set of coefficients that define a

truncated time-domain channel response and calculating a denoised frequency-domain channel response by performing a second transform based-procedure on the truncated time-domain channel response. (*See e.g.,* pg. 2, ¶[0013].) In the Office Action, it is asserted that the second "transform" reads on "adaptively". The second transform is utilized to calculate a denoised frequency response, however, this is not adaptively truncating the estimated channel impulse response in the time domain to improve a signal-to-noise ratio of the channel estimates, as claimed.

Based on at least the foregoing, it is clear that Klimovitch does not anticipate each and every limitation recited in independent claim 1 (from which claim 13 depends) and independent claim 14. Accordingly, this rejection should be withdrawn and the subject claims allowed.

IV. Rejection of Claims 25, 26, 28, 35, 36, 69 and 70 Under 35 U.S.C. §102(b)

Claims 25, 26, 28, 35, 36, 69 and 70 stand rejected under 35 U.S.C. §102(b) as being anticipated by Moose (U.S. Application No. 2002/0065047). This rejection should be withdrawn for at least the following reasons. Moose does not anticipate each and every element of the subject claims.

Claims 25, 26, 28, 35, and 36

Independent claim 25 (from which claims 26, 28, 35 and 36 depend) recites *a method of tracking channel variations during receipt of a packet using one or more receive antennas, comprising ...* ***identifying a received symbol in a packet, wherein the received symbol corresponds to an input symbol value that is not part of a training sequence ...deriving a per-symbol channel estimate from the received symbol value and an estimated input symbol value and updating an initial channel estimate using the per-symbol channel estimate.*** Moose does not anticipate such novel features.

Moose relates to correcting for distortion, phase shift and frequency offset at a receiver due to variations in the frequencies transmitted by a transmitter. (*See e.g.,* pg. 1, ¶[0011].) Moose discusses that an OFDM data symbol consists of 16 sample points that is a short guard interval filled with a cyclic extension and included to preserve the orthogonality of the sub-carrier over an FFT processing interval in unequalized channels. (*See e.g.,* pg. 2, ¶[0024].) However, nowhere does Moose discuss that any of the 16 sample points in the guard interval are an identified received symbol in a packet. Additionally, Moose does not disclose deriving a per-

symbol channel estimate from the received symbol value and an estimated input symbol value and updating an initial channel estimate using the per-symbol channel estimate, as claimed.

Claims 69 and 70

Independent claim 69 (from which claim 70 depends) recites *a method for transmitting, using a transmitter having at least one transmit antenna, training signals in a wireless communication system for use in determining channel estimates at a receiver for a wireless medium using orthogonal frequency division multiplexing (OFDM) over a plurality of OFDM subcarriers, the method comprising* ***transmitting ... one or more training symbols usable by a receiver to estimate a channel response over a legacy set of OFDM subcarriers*** *and* ***transmitting ... one or more additional training symbols usable for estimating channel response over an additional set of OFDM subcarriers.*** Thus, channel estimation can be performed for both legacy 802.11a and extended systems. Moose does not disclose such novel features.

Moose relates to algorithms that can synchronize and track packets conforming to the IEEE 802.11 standard. However, Moose does not teach or even suggest transmitting one or more training symbols for use by a receiver to estimate a channel response over a legacy set of OFDM subcarriers ***and*** transmitting one or more additional training symbols usable for estimating channel response over an additional set of OFDM subcarriers both a legacy set of OFDM subcarriers.

Accordingly, based on at least the above, Moose does not anticipate each and every element of the subject claims. Accordingly, this rejection should be withdrawn and the subject claims allowed.

V. Rejection of Claims 12, 30, 31, 33 and 34 Under 35 U.S.C. §103(a)

Claims 12, 30, 31, 33 and 34 stand rejected under 35 U.S.C. §103(a) as being obvious over Kilmovitch in view of Moose. This rejection should be withdrawn for at least the following reasons. Neither Kilmovitch nor Moose, alone or in combination, teach or suggest all limitations recited the subject claims.

> [T]he prior art reference (or references when combined) must teach or suggest all claim limitations. *See* MPEP §706.02(j). The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior

art and not based on applicant's disclosure. *See In re Vaeck,* 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Claims 12, 30 and 31 depend from independent claim 1 and claims 33 and 33 depend from independent claim 14. As discussed above, Kilmovitch does not teach or suggest all limitations of the independent claims. Specifically, Kilmovitch does not teach or suggest *adaptively truncating the estimated channel impulse response in the time domain to improve a signal-to-noise ratio of the channel estimates*, as recited in claim 1 and *adaptively truncating the time domain channel impulse response estimate to improve the signal-to-noise ratio of the channel estimates*, as recited in claim 14. Moose, when combined with Kilmovitch does not overcome the aforementioned deficiencies of Kilmovitch. Moose relates to algorithms that can synchronize and track packets conforming to the IEEE 802.11 standard but does not disclose adaptively truncating a channel impulse response, as claimed.

Thus, neither Kilmovitch nor Moose teach or suggest all claim limitations of independent claims 1 and 14 and, therefore, cannot teach or suggest all limitations of claims that depend there from. Accordingly, it is requested that this rejection be withdrawn and the subject claims allowed.

VI. Rejection of Claims 27 and 70 Under 35 U.S.C. §103(a)

Claims 27 and 70 stand rejected under 35 U.S.C. §103(a) as being obvious over Moose in view of Kilmovitch. This rejection should be withdrawn for at least the following reasons. Neither Moose nor Kilmovitch, alone or in combination, teach or suggest all claim limitations.

Claim 27 depends from independent claim 25. As discussed above, Moose does not teach or suggest ***identifying a received symbol in a packet, wherein the received symbol corresponds to an input symbol value that is not part of a training sequence …deriving a per-symbol channel estimate from the received symbol value and an estimated input symbol value and updating an initial channel estimate using the per-symbol channel estimate***, as recited in independent claim 25. Kilmovitch relates to estimating multiple-input multiple-output wireless channel. However, Kilmovitch, alone or when combined with Moose does not make up for the aforementioned deficiencies of Moose with respect to independent claim 25 and therefore, claim 27 that depends there from.

Claim 70 depends from claim 69 and, as discussed above, Moose does not teach or suggest ***transmitting ... one or more training symbols usable by a receiver to estimate a channel response over a legacy set of OFDM subcarriers*** *and* ***transmitting ... one or more additional training symbols usable for estimating channel response over an additional set of OFDM subcarriers,*** as recited in independent claim 69. Klimovitch, either alone or when combined with Moose, does not make up for the deficiencies of Moose with respect to independent claim 69.

Based on at least the above, neither Moose nor Klimovitch, either alone or in combination, do no teach or suggest all limitations of independent claims 25 and 69 and, therefore, cannot teach or suggest all limitations of claims that depend there from, namely, claims 27 and 70. Accordingly, this rejection should be withdrawn.

VII. Rejection of Claims 37-46 Under 35 U.S.C. §103(a)

Claims 37-46 stand rejected under 35 U.S.C. §103(a) as being obvious over Moose in view of Maltsev *et al.* (U.S. Application No. 2004/0120428.). This rejection should be withdrawn for at least the following reasons. The cited references do not teach or suggest all claim limitation.

Independent 37 (from which claims 38-46 depend) recites a method for determining channel estimates at a receiver for a wireless communication system using orthogonal frequency division multiplexing (OFDM) over a plurality of OFDM subcarriers, the method comprising ... ***adaptively truncating the estimated channel response in the frequency domain to improve a signal-to-noise ratio of the channel estimates***. Thus, to increase the signal-to-noise ratio of the channel estimates, the impulse response is advantageously cut off (truncated) in time at a point that optimizes a tradeoff between channel power and noise. (*See e.g.,* pg. 14, ¶[0061] and pg. 20, ¶[0084].) Neither Moose nor Maltsev *et al.* teach or suggest such novel features.

Moose relates to algorithms that can synchronize and track packets conforming to the IEEE 802.11 standard but does not teach nor suggest truncating an estimated channel response in the frequency domain to improve a signal-to-noise ratio of the channel estimates, as claimed. Further, Maltsev *et al.* relates to estimating a channel and smoothing the response "to improve the accuracy of the channel estimate" but does not teach or suggest *adaptively truncating the*

channel response to improve a signal-to-noise ratio of the channel estimate, as claimed. Therefore, Maltsev *et al.* does not make up for the deficiencies of Moose.

Based on at least the above, neither Moose nor Maltsev *et al.*, alone or in combination, teach or suggest all claim limitations. Accordingly, this rejection should be withdrawn and the subject claims allowed.

VIII. Rejection of Claims 47-57 Under 35 U.S.C. §103(a)

Claims 47-57 stand rejected under 35 U.S.C. §103(a) as being obvious over Kilmovitch in view of Maltsev *et al.* and further in view of Stuber *et al.* (U.S. Application 2003/0076777). This rejection should be withdrawn for at least the following reasons. None of the cited references teach or suggest all claim limitations.

Independent 47 (from which claims 48-57 depend) recites *a method of channel estimation for a receiver of a multiple input, multiple output (MIMO) communication system wherein signals are transmitted using orthogonal frequency division multiplexing (OFDM) over a plurality of OFDM subcarriers, the method comprising .. receiving, at each of a plurality of receive antennas, training signals from a plurality of transmit antennas,* ***wherein the training signals comprise both an IEEE 802.11a standard preamble and a MIMO preamble ... computing a channel impulse response for one of the transmit antennas using the impulse coefficients, wherein computing a channel impulse response includes adaptively truncating the channel impulse response in the frequency domain***. The cited references do not teach or suggest such novel features.

As discussed previously, Kilmovitch and Maltsev both fail to teach or suggest ***adaptively truncating the channel impulse response in the frequency domain***. Stuber *et al.* does not make up for the deficiency of Kilmovitch and Maltsev. Stuber *et al.* relates to providing efficient space-time structures for preamble, pilots and data for MIMO communication systems.

Additionally, as conceded in the Office Action, Kilmovitch (and Maltsev) fail to disclose the training signals comprise both an IEEE 802.11a standard preamble and a MIMO preamble and Stuber *et al.* is relied upon to overcome this deficiency. However, Stuber *et al.* clearly states that the IEEE Standard 802.11a "is not directly application to MIMO communications systems ... without the need for significant modifications." (*See e.g.,* pg. 1, ¶[0008]). It is clear that

Stuber *et al.* does not contemplate (and does not teach nor suggest) utilizing ***both*** an IEEE 802.11a standard preamble and a MIMO preamble, as claimed.

Accordingly, based on at least the above, none of the cited references, alone or in combination, teach or suggest all claim elements of independent claim 47 and the claims that depend there from. It is requested that this rejection be withdrawn and the subject claims allowed.

IX. Rejection of 58-68 Under 35 U.S.C. §103(a)

Claims 58-68 stand rejected under 35 U.S.C. §103(a) as being obvious over Kilmovitch in view of Stuber *et al.* This rejection should be withdrawn for at least the following reasons. Neither Kilmovitch nor Stuber *et al.*, alone or in combination, teach or suggest all claim elements.

Independent claim 58 (from which claims 59-68 depends) recites *a method for transmitting, using a transmitter having a plurality of transmit antennas, training signals in a wireless communication system for use in determining channel estimates at a receiver for a wireless medium using orthogonal frequency division multiplexing (OFDM) over a plurality of OFDM subcarriers, the method comprising* ***transmitting, at each of a plurality of transmit antennas, training signals comprising both an IEEE 802.11a standard preamble and a MIMO preamble, wherein the MIMO preamble is a preamble transmitted over two or more of the transmit antennas.*** Neither of the cited references teach or suggest such novel features.

As conceded in the Office Action, Kilmovitch "fails to disclose the training signals comprise both an IEEE 802.11a standard preamble and a MIMO preamble" and Stuber *et al.* is relied upon to overcome this deficiency. However, Stuber *et al.* does not teach or suggest using ***both*** preambles. Instead Stuber *et al.* discusses that the IEEE Standard 802.11a preamble structure and specifically states that "[the IEEE Standard 802.11a preamble] is not directly applicable to MIMO communication systems." (*See e.g.,* pg. 2, ¶[0008]).

Based on at least the above, it is clear that both Kilmovitch and Stuber *et al.* fail to teach or suggest all claim limitations. According this rejection should be withdrawn and the subject claims allowed.

X. Rejection of Claims 71 and 72 Under 35 U.S.C. §103(a)

Claims 71 and 72 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Moose. This rejection should be withdrawn for at least the following reasons. Moose does not teach or suggest all claim limitations.

Claims 71 and 72 depend from independent claim 69. As discussed above, Moose does not teach or suggest ***transmitting ... one or more training symbols usable by a receiver to estimate a channel response over a legacy set of OFDM subcarriers*** *and* ***transmitting ... one or more additional training symbols usable for estimating channel response over an additional set of OFDM subcarriers.***

Based on at least the above, Moose does not teach or suggest all limitation of independent claim 69 and, therefore, cannot teach or suggest all limitations of claims that depend there from, namely, claim 71 and 72. Therefore, this rejection should be withdrawn.

XI. Rejection of Claims 73 Under 35 U.S.C. §103(a)

Claim 73 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Moose in view of Klimovitch. This rejection should be withdrawn for at least the following reason. Neither Moose nor Klimovitch teach or suggest all claim limitations.

Claim 73 depends from independent claim 69 and, as discussed above, Moose fails to teach or suggest ***transmitting ... one or more training symbols usable by a receiver to estimate a channel response over a legacy set of OFDM subcarriers*** *and* ***transmitting ... one or more additional training symbols usable for estimating channel response over an additional set of OFDM subcarriers.*** Klimovitch relates to estimating multiple-input multiple-output wireless channels, but does not make up for the deficiencies of Moose.

Based on at least the above, neither of the references, alone or in combination, teach or suggest all claim limitations. Therefore, it is requested that this rejection be withdrawn.

XII. Rejection of Claim 74 Under 35 U.S.C. §103(a)

Claim 74 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Hudson (U.S. Application No. 2003/0043887 in view of Maltsev *et al.* This rejection should be withdrawn for at least the following reasons. Neither Hudson nor Maltsev *et al.* teach or suggest all claim limitations.

Independent 74 recites *a method for determining channel estimates at a receiver for a wireless communication system using orthogonal frequency division multiplexing (OFDM) over a plurality of OFDM subcarriers, the method comprising ...* ***adaptively truncating the estimated channel impulse response in the frequency domain***. Hudson relates to estimating channel impulse responses but does not teach or suggest adaptively truncating the estimated channel impulse response in the frequency domain, as claimed. Further, as discussed above, Maltsev *et al.* relates to estimating a channel and smoothing the response "to improve the accuracy of the channel estimate" but does not teach or suggest *adaptively truncating the channel response to improve a signal-to-noise ratio of the channel* estimate, as claimed.

Based on at least the foregoing, neither of the cited references teach or suggest all claim limitations and this rejection should be withdrawn.

CONCLUSION

The present application is believed to be in condition for allowance in view of the above comments and amendments. A prompt action to such end is earnestly solicited.

In the event any fees are due in connection with this document, the Commissioner is authorized to charge those fees to Deposit Account No. 50-1063 [QUALP700USA].

Should the Examiner believe a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact applicants' undersigned representative at the telephone number below.

Respectfully submitted,

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